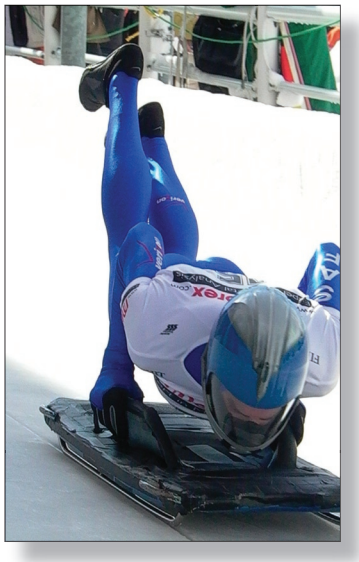
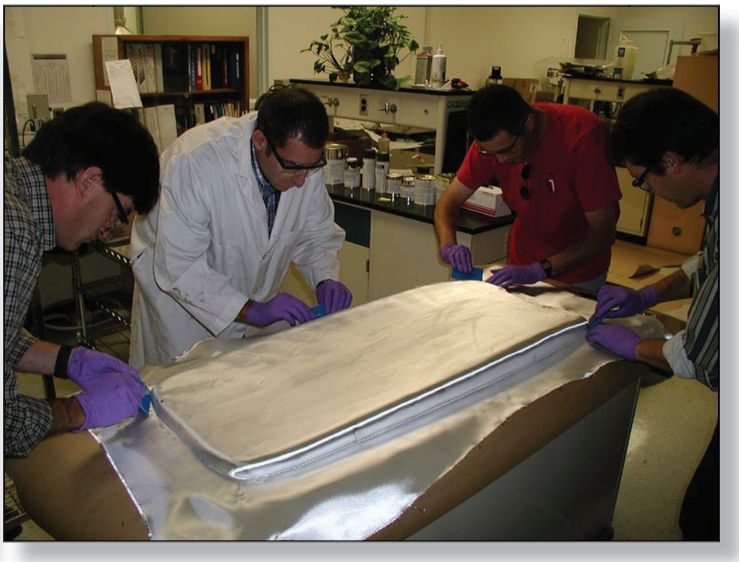
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

ADVANCED COMPOSITES CARRY OLYMPIC HOPEFUL TO NATIONAL SLED RACING TITLE





Engineers at the Materials and Manufacturing Directorate's Advanced Composites Office (ACO) at Hill Air Force Base, Utah, redesigned the aerodynamic component of skeleton racing sleds raced by world-class Air Force athletes vying for positions on the US Men's Winter Olympic team. ACO engineers used the techniques learned and perfected during redesign of the skeleton sleds to build a horizontal tail advanced technology demonstrator, several elevator skin prototypes for the A-10, and subscale composite spars for composite design and manufacturing classes.

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Accomplishment

Major Brady Canfield won a bronze medal at the World Championships in Nagano, Japan and the 2003 US Men's National Skeleton Championship using the new design. The redesign effort provided hands-on computer aided design (CAD) and three-dimensional (3-D) modeling experience for new engineers at ACO, resulting in improved lay-up techniques.

Background

Skeleton racing originated in St. Moritz, Switzerland during the late 1800s and is the oldest known competitive downhill sled racing sport in the world. The sled is composed of steel chassis, steel runners, and a steel (sometimes fiberglass) sheet or pod affixed to the underside of the chassis to provide aerodynamic benefits similar to the underside of Formula One race cars. The athlete lies face down on top of the sled in a head-first position and whips through a curving, ice-coated track for fastest time, sometimes at speeds exceeding 80 mph.

A hand-built model of the sled pod was used to generate a 3-D representation, which was then placed into the CAD program used to change the shape of the part. To optimize the airflow contour of the part, ACO engineers made two different part designs, each conforming to the standard 2-feet wide by 3-feet long dimensions. Next, they downloaded the model to a five-axis router and cut a wooden master. They used the master to make a fiberglass female mold and then produced a hand lay-up part from the mold using the same graphite epoxy sometimes employed on aircrafts. Finally, they autoclave cured the new pod to provide the needed strength and stability.

The ACO manufactured a total of five graphite/epoxy sled pods for the Air Force skeleton racing athletes. During the 2002 Winter Olympics qualifying races, Maj Canfield won fourth place and Senior Airman Trevor Christy finished in the top 10. These results demonstrated significant improvement in the race times of both athletes using the ACO composite pods. Using the new composite sled design, Maj Canfield achieved an overall World Cup ranking of 11th place, which qualified him for the World Championships in Japan. Canfield finished third, winning the bronze medal. He further solidified his standings by winning the Men's National Skeleton Championship in Lake Placid, New York.

Materials and Manufacturing
Emerging Technologies

Additional information

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